

REMARKS

This Amendment, filed in reply to the Office Action dated May 26, 2005, is believed to be fully responsive to each point of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

As preliminary matters, the Examiner objects to the title. A proposed title is set forth in the attached Appendix.

Turning to the merits of the Office Action, claims 1-19 remain pending in the application. Claims 1, 2, 4, 5, 7, 8-15 and 17 have been rejected under 35 U.S.C. § 102 as being anticipated by Manni (U.S. Publn. 2002/0196414). Claims 6-7 and 16-17 have been rejected under 35 U.S.C. § 103 as being unpatentable over Manni. Claims 3 and 10 have been rejected under 35 U.S.C. § 103 as being unpatentable over Manni in view of Koyama (U.S.P. 5,949,503). Applicant respectfully submits the following arguments in traversal of the prior art rejections.

As an initial matter, the Examiner has not set forth a rejection for claims 18-19. Applicant would submit that these claims should be deemed allowable. Should the Examiner cite a new rejection of these claims, the rejection must be on a non-final basis.

The present invention differs from cited reference Manni (U.S. Publn. 2002/0196414) for at least the following reasons.

(i) In the present invention, the optical integrator using a fly-eye lens is used for spatially dividing light beams whose correlation (intensity distribution) of intensity and location at an irradiated surface is not uniform. The integrator thereafter combines the light beams by a condenser lens to attain uniform intensity distribution of the light beams. On the other hand, the structure of Manni is used for the purpose of superposing light that is divided beforehand by

using numerous light sources and corresponding microlenses. Therefore, the structure of Manni does not correspond to the structure of the present invention in which light beams with non-uniform intensity distribution are once divided and thereafter combined to have uniform intensity distribution. The reason for the above structural difference is that Manni is directed to superpose light beams having various wavelengths in order to obtain desired wavelength distribution (See Figs. 5-8 of Manni), and not directed to have uniform intensity distribution.

(ii) In Manni, each laser has a different central wavelength in its design, and laser light emitted from one laser light source enters one lens of a microlens array. That is, the number and the position of the fibers correspond to the number and position of the lenses on the microlens array in a one-on-one relation. However, in the present invention, the number of the bundled fibers and the position of the fibers do not have to coincide with the number and the position of the lenses in a lens array constituting an optical integrator of a fly-eye type. It is only necessary to substantially match the profile of the light emission face of the fiber bundle with an emission face of the optical integrator through which the light thereafter passes.

The above difference from Manni is extremely important for the present invention. This is because if Manni's light source were to be adopted and fibers correspond one-on-one with respective lenses, luminance of the light source will decrease, and etendue will increase. Therefore, it becomes impossible to attain high efficiency of illumination due to high luminance, which is one of the objects of the present invention.

In addition to bundling of fibers, the present invention has a feature in that illumination efficiency can be further increased by matching the profile of the emission face of an optical integrator with the bundled fibers.

Furthermore, it is advantageous to keep etendue at a low level by having a fiber bundle to be a high luminance light source, because deep focal depth at an exposure surface can be achieved. Manni does not show any effects as described above

(iii) The Examiner has pointed out that Manni discloses that a profile of a light emission face of a fiber bundle substantially matches an emission face of an optical integrator through which the light thereafter passes. However, this structure in Manni is due to light not being divided by an optical integrator as described in (i), and is a result of a light source corresponding one-on-one with a lens of a lens array as described in (ii). Therefore, Applicant submits that Manni does not indicate the present invention's concept that, in order to obtain high illumination efficiency, a profile of a light emission face of a fiber bundle is made to substantially match a profile of an emission face of an optical integrator through which the light thereafter passes. Applicant submits that the elements 34 of Manni cannot be fibers because they have gaps therebetween and are not closely packed. Moreover, Manni has no intention to attain high illumination efficiency due to high luminance by using a fiber bundle.

(iv) In Fig. 2 in Manni, which seems to be a sideview of a laser array shown in Fig. 1, "light emitting array" is shown to correspond to a light source. In this figure, laser elements are disposed in a lattice pattern. On the other hand, the point in the present invention is integration of a fiber bundle and a profile of its emission face, and it is not necessary at all that laser elements themselves are disposed in an array.

For the foregoing reasons, claims 1 and 8 are patentable over Manni. The remaining claims are patentable based on their dependency.

With further regard to claim 3, the Examiner correctly concedes that Manni does not teach an optical integrator as a rod-type integrator and cites Koyama to make up for this deficiency. The Examiner appears to suggest that the rod type integrator can simply be substitute into the Manni device. However, as discussed above, since the present invention differs from Manni in that the light beams are divided in an optical integrator of a fly-eye type, Applicant submits that the Examiner's argument does not hold. An optical integrator of a rod type angularly divides light beams by multiple reflections using a hollow rod, and then recombines the light beams at an emission face, so that the intensity distribution thereof can be made uniform. In Manni, it is only necessary to combine emitted light from each light source.

With further regard to pending claim 5, this claim describes a spatial light modulator disposed in a tilted manner so that a predetermined angle is formed by a direction of the side of the modulator and a main scanning direction. The Examiner cites paragraph [0035] of Manni to teach this feature. However, the cited portion generally discusses different modulators in relation to lenses, but does not describe the tilt as claimed. Claim 15 is patentable for analogous reasons, and claims 6 and 16 are patentable based on their respective dependencies.

With regard to pending claim 7, this claim describes a relation between a diameter of a core or clad layer is changed depending on the number of optical fibers. The Examiner correctly concedes that Manni does not teach this feature but contends that one skilled in the art would be motivated to make the claimed invention. The Examiner's conclusion on this point is not supportable since it has no support in the cited art. To the extent that the Examiner is relying on Official Notice in making such an assertion, we would request the Examiner to supply an

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appropriate prior art reference along with a proper motivation to combine such reference with the art of record.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.


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